AD-A094 250 NAVAL SEA SYSTEMS COMMAND WASHINGTON DC F/G 15/5
RELIABILITY (R) AND MAINTAINABILITY (M) DESIGN CHECKLIST.(U)
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UNCLASSIFIED NAVSEA-S0300-AC-MMA-010-R NL

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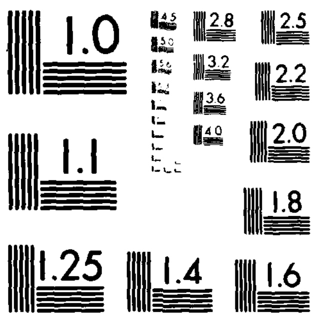

MICROCOPY RESOLUTION TEST CHART

ERRATA SHEET - NAVSEA S0300-AC-MMA-010-R&M

P. 11 add

	Yes	No
(q) Are warning lables provided on equipment stating that assemblies, subassemblies etc. contain electrostatic sensitive devices?	___	___
(r) Are handling warnings placed in maintenance aides (T.M., MRC's, etc.) where assemblies, subassemblies, etc. involved in maintenance action contain electrostatic sensitive devices?	___	___

P. 14 add

to (aa)

Has each suppliers parts been tested in the intended use circuit(s)?	___	___

P. 20 add

(o) Is the handling of the following failed items controlled by procedures such that further damage to the item beyond the original failure is not incurred:

(1) Assembly	___	___
(2) Subassembly?	___	___
(3) Printed Circuit Board?	___	___
(4) Part?	___	___

(p) Is the failed non-repairable (throwaway) item stored in a retrievable, protected, and controlled storage facility with its failure data attached?	___	___

FOREWORD

This document has been developed by the Naval Ship Engineering Center of the Naval Sea Systems Command to aid in the assurance of adequate levels of Reliability (R) and Maintainability (M) of Naval shipboard equipment. It consists of two separate but complementary checklists for reviewing and evaluating a contractor's R program and M program with emphasis on the detailed R&M design efforts. In addition to the detailed R&M design efforts (Sections 2 through 11 and 22 through 28) these checklists also cover the areas of: R&M Management (Sections 1 and 21); and R&M Demonstration Test Planning (Sections 12 and 28). During a program applicable sections of these checklists should be completed and updated as the program progresses.

These checklists can be provided to the contractor to be used as guides for establishing and implementing his R&M programs, or can be contractually required to be completed by the contractor and submitted as a data item to the Navy prior to formal design reviews. They can be used by the Navy for randomly auditing the contractor's R&M program, design effort and demonstration test planning effort; as guides for evaluating R&M during design reviews; or used for follow-up of corrective action in areas found to be deficient.

Although these checklists were developed for electronic equipment acquisition, the majority of the questions contained therein are equally applicable to electrical, mechanical and electro-mechanical systems and equipment.

The Naval Ship Engineering Center welcomes comments and suggestions on the use and improvement of this document. Please direct all comments in writing to: Naval Ship Engineering Center, Code 6181B, Washington, D.C. 20362.

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SECTION 1

MAINTAINABILITY (M) DESIGN CHECKLIST

MAINTAINABILITY (M) DESIGN CHECKLIST
(160 Basic Questions)

		Page
1.	Management	1
2.	Maintenance Concept	3
3.	Design for Accessibility	5
4.	Mounting Provisions	9
5.	Handling Provisions	10
6.	Built-In Test (BIT) Provisions	12
7.	Test Point Provisions	14
8.	Adjustment/Alignment/Calibration Provisions	16
9.	Tools and Test Equipment	18
10.	Connectors	19
11.	Cables	22
12.	Maintainability Demonstration Test Planning	24

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
1	**Management**			
(a)	Does contractor have a permanent in-house M staff?	___	___	
(b)	Is staff composed of experienced M engineers?	___	___	
(c)	Does program M engineer report directly to program manager?	___	___	
(d)	Does M group have the facility/authority to interface directly with other engineering groups:			
	(1) Design?	___	___	
	(2) Systems Engineering?	___	___	
	(3) Quality Control?	___	___	
	(4) Integrated Logistics Support?	___	___	
	(5) Procurement?	___	___	
	(6) Test and Evaluation?	___	___	
(e)	Is M group representative(s) member(s) of design review team?	___	___	
(f)	Does M group review all drawings and specifications for adequacy of M requirements?	___	___	
(g)	Does M program engineer have sign-off authority on all drawings and specifications?	___	___	
(h)	Does M engineer/group review Purchase Orders and Purchase Specifications to assure all parts and sub-assemblies are procured with adequate M requirements?	___	___	
(i)	Does M group have membership and a voice in decisions for Engineering Change Review Board?	___	___	
(j)	Is M group represented on surveys and quality audits of potential subcontractors?	___	___	
(k)	Is M group represented at subcontractor design reviews and meetings where M is a topic of discussion?	___	___	

No.

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(l)	Does an M group member(s) monitor/witness subcontractor M tests?	___	___	
(m)	Does M group contain experts in the fields of BIT, ATE, PMFL and other fault detection/localization and isolation methodology?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
2	**Maintenance Concept**			
(a)	Is maintenance concept in accordance with specification requirements with respect to:			
	(1) Types of repairs allowable at various levels of maintenance?	__	__	
	(2) Allowable skill and manpower levels for performing maintenance (CM & PM)?	__	__	
	(3) Restrictions on special tools and support equipment?	__	__	
	(4) Ability of Built-in-Test (BIT) to detect and isolate faults to specified levels of assembly?	__	__	
	(5) Sparing requirements/Navy sparing philosophy?	__	__	
	(6) Use of throwaways/Navy throwaway philosophy?	__	__	
	(7) MTTR/MCT_{MAX}?	__	__	
	(8) Test Point Requirements?	__	__	
(b)	Is proposed maintenance concept cost effective with respect to:			
	(1) Repairs to be performed at different levels of maintenance?	__	__	
	(2) Transportation cost and time to send repairables to depot?	__	__	
	(3) Designation of modules as non-repairable?	__	__	
	(4) Test equipment proposed for organizational/intermediate levels of maintenance?	__	__	
	(5) Proposed sparing requirements?	__	__	
(c)	Is maintenance concept compatible with Navy repair facilities for:			
	(1) Organizational level:			
	(a) Test/support equipment and tools?	__	__	
	(b) Manpower/skill levels requirements?	__	__	
	(2) Intermediate level:			
	(a) Test/Support equipment and tools?	__	__	
	(b) Manpower/skill levels requirements?	__	__	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(c) (Cont'd)	(3) Depot Level:			
	(a) Test/support equipment and tools?			
	(b) Manpower/skill levels requirements?			
(d)	Does technical manual include information for repairs at:			
	(1) Organizational level?			
	(2) Intermediate level?			
	(3) Depot level?			
(e)	Is training program consistent with:			
	(1) Available skill levels at organizational level?			
	(2) Repairs to be performed at organizational level of maintenance?			
	(3) Special tools/support equipment to be used?			
	(4) Special handling for Electro Static Discharge (ESD)?			
	(5) Other special conditions?			
(f)	Has consideration been given to ensure the capability to transport, preserve, package and handle the equipment being procured?			
(g)	Is technical data package complete and adequate for equipment:			
	(1) Installation and checkout?			
	(2) Operation?			
	(3) Maintenance (Preventive and Corrective)?			

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
3	Design for Accessibility			
(a)	Is equipment as exposed and easily accessible as conditions permit?	___	___	
(b)	Structural members do not prevent access to components for removal/replacement, true?	___	___	
(c)	Are both visual and manual accesses including working envelopes provided where necessary for maintenance operations?	___	___	
(d)	Are subassemblies, especially those requiring frequent maintenance, independently removable (i.e., do not require removal of other subassemblies)?	___	___	
(e)	Do accesses satisfy safety requirements (e.g., protection of personnel from high voltage, high temperature points? Are safety warnings provided where needed)?	___	___	
(f)	Are large, heavy parts situated so they can be safely removed without damaging other components? Are weight warnings provided where needed?	___	___	
(g)	Are check points, test points, cables and connectors accessible and visible and clearly identifiable for maintenance?	___	___	
(h)	Does the design provide greatest accessibility to performance critical and high failure rate items?	___	___	
(i)	Are components mounted on an orderly two-dimensional surface rather than stacked one on another?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(j)	If rear, side or top access to components is provided in the design will installation aboard ship allow the proper use of this access?	___	___	
(k)	Have clothing constraints of maintenance personnel, if any, been considered in the accessibility of the design?	___	___	
(l)	Has design been modularized using plug-in units for ease and rapidity of removal/replacement?	___	___	
(m)	Has equipment been designed to "not require" soldering, brazing and/or welding for removal/replacement at the organizational level?	___	___	
(n)	Are hinged doors and covers used and do they have adequate swing clearances?	___	___	
(o)	Are drawers and racks used effectively to facilitate maintenance operations and do they have adequate opening clearances?	___	___	
(p)	Do hinged covers and drawers have detents/stops to lock cover or drawer in open position?	___	___	
(q)	Do large covers have locating or holding pins to facilitate replacement by one man?	___	___	
(r)	Is layout of modules logical and consistent?	___	___	
(s)	Are delicate/vital/sensitive components located or guarded so they are not susceptible to damange during maintenance?	___	___	
(t)	Are items requiring preventive/scheduled maintenance directly accessible ?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(u)	Units requiring high skill level for removal/replacement are not in the way of removal/replacement of units requiring low skill level for removal/replacement thus tying up the service of high skilled technicians for jobs which can be performed by lower skill levels?	___	___	
(v)	Are covers designed to provide maximum access (e.g., 5-sided cover vs 1-sided cover)?	___	___	
(w)	Are enclosures designed to be lifted from units rather than units lifted from enclosures?	___	___	
(x)	Are modules removable along a straight line rather than through an angle?	___	___	
(y)	Are hinged units and drawers equipped with braces to provide support in the extended position?	___	___	
(z)	Are the number of covers and panels to be removed in a maintenance action kept to a minimum?	___	___	
(aa)	Are lamps and fuses directly accessible without disassembly of unrelated items?	___	___	
(bb)	Where cables/connectors enter from the rear is access provided for test purposes?	___	___	
(cc)	Are access covers provided for items requiring frequent maintenance?	___	___	
(dd)	Where visual access is required are:			
	(1) Openings without covers provided where such will not degrade system performance?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(dd)(Cont'd)	(2) Transparent windows provided where dirt or moisture might create a problem?	___	___	
	(3) Break resistant glass windows provided where wear, heat or contact with solvent would cause optical deterioration?	___	___	
	(4) Quick opening metal covers provided where glass will not meet stress or other requirements?	___	___	
(ee)	Are safety interlocks provided to protect maintenance personnel from hazardous voltages, etc.?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
4	Mounting Provisions:			
(a)	Are standard types of fasteners used throughout?	___	___	
(b)	Are captive fasteners used whenever practicable?	___	___	
(c)	Are quick release fasteners used where structural integrity would not be compromised?	___	___	
(d)	Are the number and diversity of structural fasteners kept to a minimum commensurate with structural/bonding requirements?	___	___	
(e)	Are the fasteners selected to keep the number of required tools to a minimum?	___	___	
(f)	Are modules/components mounted/oriented to facilitate identification for maintenance?	___	___	
(g)	Are alignment pins and guides provided where necessary or practical?	___	___	
(h)	Have mounts been chosen that are appropriate to the expected environment (e.g., shock, vibration, corrosion due to dissimilar metals, etc.)?	___	___	
(i)	Have measures been taken to prevent improper orientation, mounting or installation of units by coding or keying?	___	___	
(j)	Are similar components with different functional properties readily identifiable and distinguishable and not physically interchangeable in their mounting positions?	___	___	
(k)	Are the types of fastener heads consistent with torque requirements to prevent stripping or rounding?	___	___	
(l)	Are the number of fasteners on covers/doors kept to a minimum, hand operated and of the quick release type?	___	___	
(m)	Are module racks marked with module part numbers?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
5	Handling Provisions:			
(a)	Are all sharp/pointed edges either rounded, finished or protected to prevent injury to maintenance personnel?	___	___	
(b)	Do large, heavy or bulky replacement items have handles or lifting/grasp areas for ease of handling?	___	___	
(c)	Are handles/grasp areas where used located over center of gravities to preclude swinging or tilting when lifted?	___	___	
(d)	Do hinged or foldout handles have stop positions for locking handles perpendicular to mounting surface?	___	___	
(e)	Are handle openings large enough to obtain required grasp for the item weight?	___	___	
(f)	Is maximum weight of a replaceable item limited to the following (Ref.: MIL-STD-1472A, Table X):			

Height of Lift Above Ground	Maximum Weight of Item	Yes	No
5 ft (152 cm)	35 lb (16 kg)	___	___
4 ft (122 cm)	50 lb (23 kg)	___	___
3 ft (91 cm)	65 lb (29 kg)	___	___
2 ft (61 cm)	80 lb (36 kg)	___	___
1 ft (30 cm)	85 lb (39 kg)	___	___

No.	Item Description	Yes	No	Remarks
(g)	Have all replaceable items been sized and weighted to be easily handled by one man?	___	___	
(h)	Are items weighing above one-man lift capability prominently so labeled (e.g., mechanical lift required, 2-man lift required)?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(i)	Are lift points for items requiring mechanical/power lift appropriately labeled?	___	___	
(j)	Where the use of extra heavy replaceable items cannot be avoided are means provided for using mechanical lifting devices and proper lifting clearances (e.g., eye bolts)?	___	___	
(k)	Are such design features as tongue and slot catches used to minimize the number of fasteners required?	___	___	
(l)	Are heads of mounting bolts and fasteners located on surfaces readily accessible to the technician?	___	___	
(m)	Are combination bolt head and slotted hex head fasteners used where feasible to allow removal by different tools?	___	___	
(n)	Are irregular, fragile and awkward extentions such as cooling ducts, wave guide, etc., designed for easy removal from a unit before handling?	___	___	
(o)	Are rests and stands provided for irregularly shaped modules that could be easily damaged if not properly supported?	___	___	
(p)	Is storage space provided within the equipment for special tools, card pullers, ESD shorting bars; ESD protective bags, etc. (where required)?	___	___	

No.	Item Description	Yes	No	Remarks
6	Built-in Test (BIT) Provision:			
(a)	Are circuits packaged on a functional basis to assist in detection and isolation of a faulty module?	___	___	
(b)	Has the BIT been automated to the fullest extent practicable?	___	___	
(c)	Has a balanced combination of automatic/semi-automatic/manual BIT, and classic trouble-shooting techniques been considered to avoid an overly complex automatic BIT with a high failure rate (in excess of 10% of system failure rate), and provide an efficient/effective method for trouble-shooting all faults?	___	___	
(d)	Is the BIT cost effective with regards to first cost and decreased maintenance burden?	___	___	
(e)	Does BIT meet specified probability levels (where levels are not specified, reasonably achieveable levels), of fault detection, isolation and specified times to fault locate when specified?	___	___	
(f)	Has BIT been designed with fail safe features to preclude failures of the BIT affecting operation of the equipment?	___	___	
(g)	Does the BIT provide fault isolation to specified number of lowest replaceable units (where not specified are numbers reasonable)?	___	___	
(h)	Does BIT provide continuous monitoring of critical circuits (e.g., coolant water temperature; power supply output voltage)?			
(i)	Have diagnostic programs been developed for processors/computers used within the system (where applicable) which provide a high degree of confidence in the functioning of the computer?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(j)	Does BIT provide a "go-no-go" indication of an equipment function?	___	___	
(k)	Is BIT capable of detecting degradation of equipment performance outside of specified limits rather than just catastrophic failure?	___	___	
(l)	Has BIT eliminated the need for special auxilliary test equipment?	___	___	
(m)	Has provisions been incorporated in the BIT design to differentiate BIT failure from system failure?	___	___	
(n)	Does the BIT provide an easily disernable alarm upon detection of a fault (e.g., audible alarm)?	___	___	
(o)	Does BIT perform a confidence check to eliminate/reduce the possibility of false alarms?	___	___	
(p)	Does BIT and other fault isolation techniques sequence testing in order of most frequently occurring faults?	___	___	
(q)	Is fault isolation sequence performed in a manner to minimize backtracking?	___	___	
(r)	Is BIT designed to keep the equipment on the line for confidence checks or to keep off-line time to a minimum?	___	___	
(s)	Does BIT and fault isolation procedures flow in a logical sequence?	___	___	
(t)	Is there a design feature to test lamps to preclude shut-down of the system due to an erroneous indication of equipment failure?	___	___	

No.	Item Description	Yes	No	Remarks
7	Test Point Provisions:			
(a)	Are circuits packaged on a functional basis to reduce the number of required test points?	___	___	
(b)	Are test points centrally located and grouped into connectors to facilitate testing?	___	___	
(c)	Are test points grouped in a logical manner for systematic trouble-shooting?	___	___	
(d)	Are test points directly accessible without removal of covers, components or subassemblies?	___	___	
(e)	Are test points buffered to prevent damage to circuitry due to inadvertent shorting?	___	___	
(f)	Are test points labeled and readily identifiable via:			
	(1) Symbol or name?	___	___	
	(2) Tolerances of signals?	___	___	
	(3) Test parameters?	___	___	
	(4) Color coded?	___	___	
(g)	Are test points protected from high voltage hazards to prevent high voltage from being induced in the circuit?	___	___	
(h)	Are jacks rather than terminals used to avoid test probes from slipping off test points?	___	___	
(i)	When terminals are used for test points, do they contain ears/flags for attaching alligator clips, barriers, or holes for inserting test probes to keep probe from slipping off the terminal?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(j)	Are voltages at test points limited to a maximum of 300 volts RMS where possible (eliminates need for warning plates, barriers, guards and enclosures)?	___	___	
(k)	Where voltages exceed 300 volts RMS but are less than 500 volts RMS, do they have guards or barriers to prevent accidental contact with such voltages?	___	___	
(l)	Where voltages exceed 500 volts RMS, is the part with the voltage enclosed and a warning plate provided in close proximity?	___	___	
(m)	Where connectors and parts used for test points are located on the external surface of the equipment, are covers provided to keep out dirt and moisture?	___	___	
(n)	Are test points selected to minimize circuit loading or detuning caused by the connection of test equipment?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
8	Adjustment/Alignment/Calibration Provisions:			
(a)	Are adjustments kept to a bare minimum?	___	___	
(b)	Are adjustment points readily accessible, both physically and visually?	___	___	
(c)	Can adjustments be performed without the need for special tools?	___	___	
(d)	Can adjustments be performed without the need for special test equipment?	___	___	
(e)	Are adjustments designed so that modules can be adjusted prior to being installed in the equipment?	___	___	
(f)	Are adjustments designed to be independent so that the adjustment of one module does not require subsequent adjustment or alignment of other modules in the equipment?	___	___	
(g)	Are knobs used for frequent, common adjustments?	___	___	
(h)	Are factory set adjustments, sensitive adjustments, or calibrations that are critical and not performed frequently or need test equipment to perform the alignment protected from being inadvertently disturbed?	___	___	
(i)	Are reference scales provided for adjustment controls to aid in performing the adjustments?	___	___	
(j)	Do adjustment controls contain resistance to movement as to not be disturbed by vibrations and shocks typical of its use environment?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(k)	Are adjustment controls located away from hazards such as high voltage/high temperature areas and rotating/ moving parts?	___	___	
(l)	Are mechanical stops provided for those adjustments whose over-adjustment could cause damage to the equipment?	___	___	
(m)	Are holes for mounting screws large enough to permit alignment considering positioning tolerance of fasteners/mounting holes?			

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
9	Tools and Test Equipment:			
(a)	Is the need for special tools and auxilliary or special test equipment justifiable?	___	___	
(b)	Are standard tools and test equipment used to the fullest extent practicable?	___	___	
(c)	Are all tools and test equipment needed defined?	___	___	
(d)	Are special tools required for adjustment or maintenance securely mounted within the equipment in a readily accessible location?	___	___	
(e)	Are storage spaces provided within the test equipment for the necessary leads, probes, spares, manuals and special tools to be used with the test equipment?	___	___	
(f)	Are instructions for operating the test equipment provided on the face of the equipment in a lid or special compartment?	___	___	
(g)	Are the performance requirements for the test equipment clearly specified with respect to:			
	(1) Types of measurements?	___	___	
	(2) Accuracy?	___	___	
	(3) Range of measurements?	___	___	
	(4) Calibration requirements?	___	___	
	(5) Special requirements if applicable?	___	___	
(h)	Are adapters, interface boxes, extender cards or cables defined for use with the test equipment?	___	___	
(i)	Is test equipment ruggedized to meet environmental requirements?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
10	Connectors:			
(a)	Are standard connectors used in the design?	___	___	
(b)	Are quick disconnect connector plugs provided wherever feasible (requiring no more than one turn)?	___	___	
(c)	Are connector plugs keyed to prevent inserting a wrong plug into a receptacle?	___	___	
(d)	Are mating connecting plugs and receptacles clearly identified by color coding or labeling?	___	___	
(e)	Are connector plugs or receptacles provided with alignment pins or devices to aid in correct mating without bending pins?	___	___	
(f)	Do aligning pins extend beyond the plug electrical pins to insure that alignment is obtained prior to electrical pin engagement?	___	___	
(g)	Are plugs and receptacles arranged so that aligning pins/devices are oriented in the same relative position?	___	___	
(h)	Do plugs and receptacles show positions of aligning pins/devices for proper insertion?	___	___	
(i)	Are connectors adequately spaced so that they can be firmly grasped for connecting and disconnecting (1-inch minimum)?	___	___	
(j)	Is the rear of the plug receptacle accessible for testing and servicing?	___	___	
(k)	Are large plug-in/slide-in modules and drawers on rails fitted with rack and panel type connectors with guide pins?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(l)	Do connectors have removable pins/contacts?	___	___	
(m)	Can connectors be disassembled and pins replaced without the need for special tools?	___	___	
(n)	When adapters are required are they capable of being hand-tightened?	___	___	
(o)	Are connectors fitted with cable clamps to prohibit cables from being pulled out of contact terminals?	___	___	
(p)	Are insertion and withdrawal forces for connectors within the capability of one hand?	___	___	
(q)	Where large connectors requiring high insertion and withdrawal forces are used, are mechanical advantage devices provided to allow insertion and withdrawal with ease?	___	___	
(r)	Do spare connector contacts on all connectors meet the following requirements:			
	Total No. of Contacts in Connector — **Minimum Spare Contacts?**			
	Up to 25 — 2	___	___	
	26-100 — 4	___	___	
	101 and over — 6	___	___	
(s)	Are connector shells used that can be mounted from the outside rather than inside of the equipment (e.g., square flanged)?	___	___	
(t)	Are connector shells finished with a non-conductive finish?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(u)	Are female contacts always used on the hot side of the circuit?	___	___	
(v)	Are protective connector covers provided for use when *connectors* are not in use?	___	___	
(w)	Are female contacts recessed to avoid shock when being handled?	___	___	

No.	Item Description	Yes	No	Remarks
11	**Cables:**			
(a)	Are standard type cables/wiring used?	___	___	
(b)	Are all cables/wires color coded or appropriately labeled for identification?	___	___	
(c)	Do cables/wires have sufficient slack/service loops for drawer retraction, door opening, connector insertion/removal, removal of units where connectors are not readily accessible inside the equipment?	___	___	
(d)	Are wires/cables laced, taped, spiral wrapped or otherwise formed into harnesses for ease of handling and installation?	___	___	
(e)	Are wires in modules or on printed circuit boards laced and tied down?	___	___	
(f)	Are multi-conductor cables fitted with spare leads?	___	___	
(g)	Are wires logically grouped and routed in the equipment chassis?	___	___	
(h)	Are planned performed wiring harnesses used?	___	___	
(i)	Are cables secured by clamps at proper intervals so they do not move or flex during shock or vibration?	___	___	
(j)	Are clamps properly sized and fitted with resilient material to avoid damage to cables?	___	___	
(k)	Are cable clamps of the quick disconnect/release type?	___	___	
(l)	Are solder or crimp type connectors used consistently throughout the design for same application?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(m)	Where test cables terminate on control or display panels are they so located as not to interfere with controls or displays?	___	___	
(n)	Are cables routed so as to be readily accessible for inspection and repair?	___	___	
(o)	Are cables routed or protected from being damaged by doors, lids or personnel?	___	___	
(p)	Where cables are routed through holes in metal partitions are they protected from damage or wear by grommets or equivalent means?	___	___	

MAINTAINABILITY (M) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
12	Maintainability Demonstration Test Planning			
(a)	Has an M test team been organized?	___	___	
(b)	Does this test team have government representatives?	___	___	
(c)	Are the following to be demonstrated:			
	(1) $MTTR/MCT_{MAX}$ or ERT for:			
	• Corrective Maintenance?	___	___	
	• Preventive Maintenance?	___	___	
	(2) Test point adequacy?	___	___	
	(3) Built-in Test:			
	• Size of fault groups?	___	___	
	• Probabilities of fault detection/isolation?	___	___	
(d)	Have tasks been selected in accordance with the procedures of MIL-STD-471 Appendix A?	___	___	
(e)	Have a sufficient number of tasks (twice the number to be demonstrated) been selected to allow for substitute tasks when required?	___	___	
(f)	Will technical manual be available for use during the demonstration?	___	___	
(g)	Will test be performed per agreed upon schedule?	___	___	
(h)	Will Navy be notified at least 30 days prior to start of test?	___	___	
(i)	Is test DD 1423 documentation on schedule?	___	___	
(j)	Will test area simulate shipboard installation with respect to access restrictions, working envelopes, etc.?	___	___	
(k)	Will test technician be provided by:			
	(1) Navy?	___	___	
	(2) Contractor?	___	___	
	Resume submitted?	___	___	
	Name ______________________			

SECTION II

RELIABILITY (R) DESIGN CHECKLIST

RELIABILITY (R) DESIGN CHECKLIST

Page

21. Management 1
22. Design for R 3
23. Parts Program 11
24. Developmental Test Program 15
25. Reliability Analysis 16
26. Burn-in Program 18
27. Failure Reporting Analysis and Corrective Action (FRACA) Program 19
28. Reliability Demonstration Test Planning 21

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
21	Management			
(a)	Does contractor have a permanent in-house R staff?	___	___	
(b)	Is staff composed of experienced R engineers?	___	___	
(c)	Does program R engineer report directly to program manager?	___	___	
(d)	Does R group have the facility/authority to interface directly with other engineering groups:			
	(1) Design?	___	___	
	(2) Systems engineering?	___	___	
	(3) Quality Control?	___	___	
	(4) Integrated Logistics support?	___	___	
	(5) Procurement?	___	___	
	(6) Test and Evaluation?	___	___	
(e)	Is R group representative(s) member(s) of design review team?	___	___	
(f)	Does R group review all drawings and specifications for adequacy of R requirements?	___	___	
(g)	Does R program engineer have sign-off authority on all drawings and specifications?	___	___	
(h)	Does R engineer/group review Purchase Orders and Purchase specifications to assure all parts and subassemblies are procured with adequate R requirements?	___	___	
(i)	Does R group have membership and a voice in decisions for the following:			
	(1) Material Review Board?	___	___	
	(2) Failure Review Board?	___	___	
	(3) Engineering Change Review Board?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(j)	Is R group represented on surveys and quality audits of potential subcontractors?	___	___	
(k)	Is R group represented at subcontractor design reviews and meetings where R is a topic of discussion?	___	___	
(l)	Does an R group member(s) monitor/witness subcontractor R tests?	___	___	
(m)	Does R group contain experts in the fields of components/failure analyses?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
22	Design for R			
	THERMAL REQUIREMENTS:			
(a)	Have detailed thermal analysis been performed to determine component/module ambient operating temperature?	___	___	
(b)	Has a unit similar to final configuration (e.g., brassboard, preproduction unit, etc.), been instrumented to develop a thermal mapping of the design?	___	___	
(c)	Have anemometer probes been used to measure coolant air flow patterns?	___	___	
(d)	Are equipment internal cooling considerations sufficient to limit internal temperature rises to 20°C maximum?	___	___	
(e)	Are high power dissipation components (e.g., large power resistors, diodes, transformers, etc.) heat sinked?	___	___	
(f)	Where chilled water or chilled air is used for cooling have hermetically sealed components been selected due to possible moisture condensation?	___	___	
(g)	Where chilled water or chilled air is used for cooling are components shielded or otherwise protected from moisture condensation?	___	___	
(h)	Where chilled water or chilled air is used for cooling has consideration been given to removal of condensation to avoid accumulation of moisture and possible fungus growth or corrosion within the equipment?	___	___	
(i)	Are all printed circuit boards conformally coated?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(j)	Have circuit performance tests been conducted at high and low temperature extremes to assure circuit stability over the required operating temperature range?	___	___	
(k)	Do heat conducting surfaces make good contact (no air gaps) and have low thermal resistances?	___	___	
(l)	Do surface coatings and paints provide good conduction, convection and radiation coefficients for heat transfer?	___	___	
(m)	Do adhesives where used for fastening components to PCB's or chassis have good thermal conductive properties?	___	___	
(n)	Do potting, encapsulation and conformal coating materials where used have good thermal conducting properties?	___	___	
(o)	Have differences in thermal expansion of interfacing materials been taken into account?	___	___	
(p)	Are high power dissipation components mounted directly to the chasis for better heat sinking rather than encapsulated or thermally insulated?	___	___	
(q)	Is thermal contact area between components and heat sinks kept to a maximum?	___	___	
(r)	Are components sensitive to heat located away from heat flow paths, power supplies and other high power dissipation components?	___	___	
(s)	Are air gaps or thermal insulation provided where necessary to avoid heat flow to temperature sensitive components?	___	___	
(t)	Are temperature overload devices/alarms used to prevent damage due to loss of cooling apparatus?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(u)	Do inlet temperature ducts have filters to prevent accumulation of dirt on assemblies which would result in reduction of heat transfer?	___	___	
(v)	Do components mounted on PCB's have adequate lead lengths and are the leads formed to relieve lead stresses during thermal expansion and contraction?	___	___	
	VIBRATION/SHOCK/STRUCTURAL REQUIREMENTS:			
(w)	Has analysis been performed to determine resonant frequencies to be experienced in the equipment environment?	___	___	
(x)	Have detailed vibration/shock/structural analyses been performed to validate structural integrity of the design?	___	___	
(y)	Have critical/unique assemblies been instrumented with accelerometers and tested to verify design adequacy with respect to vibration and shock transmissibility factors?	___	___	
(z)	Have structural mountings been designed to resonate away from resonant frequencies and their harmonics?	___	___	
(aa)	Have damping considerations been applied to subassemblies and components mounting where natural frequencies are close to expected environmental frequencies?	___	___	
(bb)	Are large components (over 1/2 oz.) being clamped or tied down to the chassis or printed circuit boards to prevent high stresses or fatigue failure of electrical leads?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(cc)	Heavy components are mounted near corners of the chassis near mounting points for direct structural support rather than between supports?	___	___	
(dd)	Centers of gravity of heavy components are kept low close to the plane of the mounts?	___	___	
(ee)	Are cables/harnesses clamped close to terminal connections to avoid resonances and prevent stress and failure at the point of connection?	___	___	
(ff)	Do cables/wires have sufficient slack to prevent stresses during thermal changes and mechanical vibration/shock?	___	___	
(gg)	Stranded wire is used when cabling might be susceptible to fatigue failure?	___	___	
(hh)	Components and subassemblies have adequate sway *space to avoid collision during vibration and shock?*	___	___	
(ii)	Welding (not spot welding) and/or riveting is used for permanently attached structural members rather than nuts and bolts?	___	___	
(jj)	All component leads have minimum bend radii to avoid overstressing?	___	___	
	MISCELLANEOUS REQUIREMENTS:			
(kk)	Has consideration been given to avoid the use of dissimilar metals?	___	___	
(ll)	Have the PCB's been designed for the following considerations: (1) PCB material is compatible with storage and operating temperature (plus operating temperature rises) with respect to:			
	(1) PCB material?	___	___	
	(2) Metal cladding/bonding strengths?	___	___	
	(3) Board warping?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(ll) (Cont'd)	(2) PCB resistivity is sufficiently high to meet circuit leakage current requirements even under high humidity?	___	___	
	(3) PCB arc resistance is sufficiently high where high voltages are present?	___	___	
	(4) PCB dielectric constraint is sufficiently low to prevent building up of unwanted capacitances?	___	___	
	(5) PCB flexural strengths (function of board material and dimensions) is sufficient to meet structural and vibration requirements?	___	___	
	(6) PCB conductors width is sufficient to handle maximum current flow without harmful heat generation or resistance drop?	___	___	
	(7) PCB's have plated through holes to aid in soldering of lead electrical connections?	___	___	
	(8) PCB conductor spacings have a minimum spacing based upon voltage between conductor (e.g., .025" per 150 volts peak)?	___	___	
	(9) PCB conductor paths are spaced and designed to keep capacitance between conductors to a minimum?	___	___	
	(10) Are PCB's conformally coated?	___	___	
(mm)	Where encapsulation, embedding and potting used, does the material have:			
	(1) Good thermal conductivity for heat transfer?	___	___	
	(2) Good electrical isolation/dielectric ?	___	___	
	(3) Provide dampening for shock and vibration?	___	___	
	(4) Thermal expansion coefficients which match those of items encapsulated?	___	___	
	(5) Will not crack or shatter under vibration and mechanical and thermal shock?	___	___	
	(6) Has good chemical stability under anticipated use environments?	___	___	

No.	Item Description	Yes	No	Remarks
(nn)	Have worst case analyses or statistical variation of parameters been conducted to determine required component electrical tolerances considering:			
	(1) Manufacturing tolerances?	___	___	
	(2) Tolerances due to temperature changes?	___	___	
	(3) Tolerances due to aging?	___	___	
	(4) Tolerances due to humidity?	___	___	
	(5) Tolerances due to high frequency or other operating constraints?	___	___	
(oo)	Has redundancy been considered for critical functions where practical?	___	___	
(pp)	Where redundancy is used, has considerations been given to avoid common mode failure situations which could disable all redundant circuits?	___	___	
(qq)	Has design practices been applied to obtain RFI suppression such as:			
	(1) Use alternating current non-commutating machinery rather than direct current machinery when feasible?	___	___	
	(2) Provide optimum interference suppression with two twisted wires in a common shield whenever wire pairs can be used?	___	___	
	(3) Use short wires in preference to long wires?	___	___	
	(4) Filter power lines to remove harmonics and other types of inherent interference?	___	___	
	(5) Mount filters as close to interference sources as possible without altering the effectiveness of the filter?	___	___	
	(6) Use bonding techniques to insure that good electrical contact is made between chassis, conduit, shielding, connectors, structural and housing metal parts?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(qq)(Cont'd)	(7) Remove non-conducting coatings from bolts, nuts, and tapped holes?	___	___	
	(8) Internally shield invididual sections of equipment which are either highly susceptible to interference or which generate interference. For example, the r-f input stages and local oscillators should be shielded individually?	___	___	
	(9) Use a bandwidth consistent with the minimum possible value for the received signal. This often improves the signal-to-noise ratio?	___	___	
	(10) Use direct current filament sources where practicable?	___	___	
	(11) Ground center tap of filament transformer secondary winding to reduce hum?	___	___	
	(12) Avoid the use of gaseous lighting devices in the vicinity of sensitive wiring or electronic equipment?	___	___	
	(13) Do not cable noisy and clean leads together?	___	___	
	(14) Never route cables near known interference sources?	___	___	
	(15) Do not use shields or metal structures for return current paths?	___	___	
	(16) Avoid the use of corrosion preventive compounds with high insulating qualities at bond joints?	___	___	
(rr)	Have considerations been given to preclude damage due to:			
	(1) Installation?	___	___	
	(2) Handling?	___	___	
	(3) Transportation?	___	___	
	(4) Storage?	___	___	
	(5) Shelf Life?	___	___	
	(6) Packaging?	___	___	
	(7) Maintenance environment?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
	(8) Other environments:			
	(a) Humidity?	___	___	
	(b) Fungus?	___	___	
	(c) Sand and dust?	___	___	
	(d) Salt atmosphere?	___	___	
(ss)	Has reliability been considered as a factor in all tradeoff studies affecting equipment reliability?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
23	Parts Program			
(a)	Does contractor have a Parts Control Board (PCB) to promote proper selection and application of parts used in the design?	___	___	
(b)	Has contractor established and maintained an up-to-date Preferred Parts List (PPL) to be used by designers?	___	___	
(c)	Has contractor established derating guidelines for derating of electrical/electronic parts electrical stresses?	___	___	
(d)	Do derating guidelines correspond to specification requirements and/or Navy proposed derating levels?	___	___	
(e)	Has contractor developed part application guidelines for proper selection of part types for circuit use?	___	___	
(f)	Are military grade parts used in the design?	___	___	
(g)	Are non-standard parts used only when a military equivalent part cannot be obtained?	___	___	
(h)	Where non-standard parts are used do they have adequate qualification/test data and a history of high reliability?	___	___	
(i)	Where non-standard parts are used are they procured via specification control drawing which specifies:			
	(1) Reliability requirements?	___	___	
	(2) Environmental requirements?	___	___	
	(3) Test requirements?	___	___	
(j)	Has contractor submitted non-standard part data for approval per applicable specification (e.g., MIL-STD-749/965)?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(k)	Do parts used in the design meet the environmental requirements to which they will be subjected during use with respect to:			
	(1) Operating temperature (plus worst case internal case temperature rises)?	___	___	
	(2) Non-operating/storage temperature?	___	___	
	(3) Humidity?	___	___	
	(4) Vibration?	___	___	
	(5) Shock?	___	___	
(l)	Have parts been reviewed for proper application, have part stresses been calculated ( ) or measured ( ) and do they meet:			
	(1) Derating guidelines?	___	___	
	(2) Application guidelines?	___	___	
(m)	Are established reliability (ER) components and JAN semiconductors and microcircuit devices used in the design?	___	___	
(n)	Where ER components are used, is the most representative level of all ER components used:			
	(1) L ?	___	___	
	(2) M ?	___	___	
	(3) P ?	___	___	
	(4) R ?	___	___	
	(5) S ?	___	___	
	(6) T ?	___	___	
(o)	Where JAN semiconductors (MIL-S-19500) are used, the most representative level of all such devices used are:			
	(1) JAN ?	___	___	
	(2) JANTX ?	___	___	
	(3) JANTXV ?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(p)	Where JAN microcircuits (MIL-M-38510) or high quality microcircuits are used the most representative level of all such devices used are:			
	(1) MIL-M-38510 Class A ?	___	___	
	(2) MIL-M-38510 Class B ?	___	___	
	(3) MIL-M-38510 Class C ?	___	___	
	(4) MIL-STD-883 Class A ?	___	___	
	(5) MIL-STD-883 Class B ?	___	___	
	(6) MIL-STD-883 Class C ?	___	___	
	(7) Vendor equivalent to _______?	___	___	
(q)	Do parts meet the interchangeability requirements of MIL-STD-454 Requirement 7?	___	___	
(r)	Do all parts selected meet the life requirements of the equipment?	___	___	
(s)	Are handling requirements specified for critical and delicate parts susceptible to damage, degradation, contamination from shock, vibration, static electric discharge, uncleanliness, etc. ?	___	___	
(t)	Are assembly and cleaning procedures specified to prevent damage to components during assembly on PCB's, chassis, etc. ?	___	___	
(u)	Have dominant failure modes of a particular part type been considered in the selection of that part?	___	___	
(v)	Are fixed rather than variable components (such as resistors, capacitors, inductors, etc.) used in the design wherever possible?	___	___	
(w)	Are all relays, motors, dynamotors, rotary power converters, etc. suppressed so as not to produce excessive spikes or transients during operation ?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(x)	Are all semiconductor devices silicon rather than Germanium?	___	___	
(y)	Plastic coated and/or encapsulated semiconductor devices are not used?	___	___	
(z)	Do all microcircuits have hermetically sealed ceramic cases rather than plastic cases?	___	___	
(aa)	Do all microcircuits used have at least two potential suppliers?	___	___	
(bb)	Do all unused gates of a digital microcircuit have *inputs grounded*?	___	___	
(cc)	Are the number of expandable gates limited to no more than 75% of allowable number of expandables?	___	___	
(dd)	Where humidity is not controlled are hermetically sealed resistors, capacitors, relays, etc., used?	___	___	
(ee)	Are all power supplies designed and manufactured in-house?	___	___	
(ff)	Are parts, even MIL-M-38510, JANTX, Established Reliability (ER) parts screened at incoming inspection:			
	(1) 100%?	___	___	
	(2) Sampling plan per ______________?	___	___	
	(3) Environmentally ______________?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
24	Developmental Test Program			
(a)	Is contractor conducting a developmental test program?	___	___	
(b)	Does developmental test program include:			
	(1) All critical assemblies?	___	___	
	(2) Each assembly with a unique form factor?	___	___	
	(3) Critical non-standard parts?	___	___	
(c)	Does developmental testing include environmental testing at or above the levels specified for qualification:			
	(1) High and low temperature?	___	___	
	(2) Vibration?	___	___	
	(3) Shock?	___	___	
	(4) Humidity?	___	___	
(d)	Are performance requirements checked over required operating temperature levels?	___	___	
(e)	Are life tests or reliability tests of critical components/subassemblies being or have they been conducted?	___	___	
(f)	Is "Step Stress" testing being performed on subassemblies, etc., to determine design margins?	___	___	
(g)	Is developmental test program monitored by the reliability group or does the reliability group provide inputs to developmental testing?	___	___	
(h)	Are failure data and maintenance data collected during developmental testing for determining need for reliability improvement?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
25	Reliability Analyses			
(a)	Have the following reliability analyses been performed:			
	(1) Reliability Mathematical Models?	___	___	
	(2) Reliability Apportionments?	___	___	
	(3) Reliability Predictions?	___	___	
	(4) Failure Modes and Effects Analyses?	___	___	
	(5) Criticality Analyses?	___	___	
	(6) Circuit Analysis (nominal and worst cases)?	___	___	
	(7) Thermal Analysis?	___	___	
	(8) *Sneak Circuit Analysis*?	___	___	
(b)	Do predictions meet apportioned values?	___	___	
(c)	Do predictions meet numerical reliability specification requirements?	___	___	
(d)	Have the results of the predictions been used to increase equipment reliability by:			
	(1) Reduction of circuit complexity?	___	___	
	(2) Reduction of ambient temperature conditions?	___	___	
	(3) Reduction of internal temperature rises?	___	___	
	(4) Reduction of part stresses by further derating?	___	___	
	(5) Increase of part quality levels?	___	___	
	(6) Addition of redundancy?	___	___	
(e)	Has a numerical approach for *Criticality Analysis* been used?	___	___	
(f)	Does the numerical criticality analysis consider:			
	(1) Frequency of failure?	___	___	
	(2) Degree of effect on system performance?	___	___	
	(3) Difficulty to diagnose and/or repair?	___	___	
	(4) Personnel or equipment safety?	___	___	
(g)	Have all critical modes of system failure been identified?	___	___	
(h)	Have critical items been ranked as to criticality?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(k)	Has the use of limited life items been kept to a minimum?	___	___	
(l)	Have the analyses considered the effects of storage, transportation and handling on failure modes, effects and failure rates?	___	___	
(m)	Has the use of circuit analysis provided a stable, design over the worst case conditions?	___	___	
(n)	Has protective circuitry been utilized in the equipment design?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
26	Burn-in Program			
(a)	Does the contractor impose burn-in at:			
	(1) Component level?	___	___	
	(2) Subassembly/module level?	___	___	
	(3) Equipment/system level?	___	___	
(b)	Is burn-in performed under:			
	(1) Temperature (elevated)?	___	___	
	(2) Temperature cycling?	___	___	
	(3) Vibration?	___	___	
(c)	Are lengths of burn-in adequate for each level?	___	___	
(d)	Do spares receive same burn-in as modules/ subassembly level?	___	___	
(e)	Do all equipments/systems receive the same amount of burn-in?	___	___	
(f)	Does contractor have a failure free burn-in requirement prior to acceptance of the equipment?	___	___	
(g)	Is random vibration performed?	___	___	
	(1) Equipment level? ______________			
	(2) "g" level? ______________			
	(3) Frequency range? ______________			
	(4) Time duration? ______________			

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
27	Failure Reporting Analysis and Corrective Action (FRACA) Program			
(a)	Has contractor implemented a FRACA program?	___	___	
(b)	Does FRACA program cover failures during:			
	(1) Source inspection at subcontractor's plant?	___	___	
	(2) Incoming inspection?	___	___	
	(3) In-process inspection?	___	___	
	(4) Development tests?	___	___	
	(5) Subassembly/module test?	___	___	
	(6) Equipment integration and checkout?	___	___	
	(7) Equipment burn-in?	___	___	
	(8) Equipment formal tests:			
	(a) Acceptance tests?	___	___	
	(b) Environmental/qualification tests?	___	___	
	(c) Reliability/Maintainability tests?	___	___	
(c)	Does contractor have in-house facilities for performing detailed failure analysis?	___	___	
(d)	Is failure analysis conducted for all failures?	___	___	
(e)	Are failures summarized by part number and failure type to determine trends and patterns?	___	___	
(f)	Has contractor established thresholds (percent defective or failure rate) for determining need for corrective action?	___	___	
(g)	Does failure report form contain the necessary information with regards to:			
	(1) Identification of failed part subassembly, assembly, etc.?	___	___	
	(2) Elapsed time meters (for failure at equipment level)?	___	___	
	(3) Failure symptoms?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(g)(Cont'd)	(4) Effect of failure on system/equipment?	___	___	
	(5) Test and environmental conditions at time of failure?	___	___	
	(6) Suspected cause of failure?	___	___	
(h)	Is the same type of FRACA program imposed upon subcontractors of critical subassemblies?	___	___	
(i)	Are subcontractor failure reports included in contractor failure summaries?	___	___	
(j)	Are all failure reports, analyses and corrective actions reviewed by the reliability group?	___	___	
(k)	Are failure trends monitored by the reliability group?	___	___	
(l)	Are corrective actions involving design changes tested in the equipment for an adequate period of time prior to their formalization?	___	___	
(m)	Are corrective action investigations reopened upon a recurrence of the same type of failure?	___	___	
(n)	Are proposed corrective actions referred to the Navy for concurrence?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
28	Reliability Demonstration Test Planning			
(a)	Will test simulate operating profile that will be seen aboard ship?	___	___	
(b)	Will all modes of equipment operation be tested?	___	___	
(c)	Is definition of failure in accordance with contract specification requirements?	___	___	
(d)	Are relevant and non-relevant failure definitions adequately defined?	___	___	
(e)	Will test be performed under environmental levels specified by the contract specifications?	___	___	
(f)	Will burn-in to be performed on reliability test units be no more or no less than that specified for production units?	___	___	
(g)	Non-operating and equipment standby time will be discounted from applicable test time for validating reliability, true?	___	___	
(h)	No Preventive Maintenance other than that contained in technical manuals and approved by the Navy will be performed during the test, true?	___	___	
(i)	Performance checks capable of checking the complete equipment failure rate, performed no less frequently than daily have been defined for the test, true?	___	___	
(j)	Test will be performed per agreed schedule, true?	___	___	
(k)	Navy will be notified of the exact test date at least 30 days prior to the test, true?	___	___	
(l)	All interfaces are simulated or stimulated?	___	___	
(m)	All interfaces are real?	___	___	

RELIABILITY (R) DESIGN CHECKLIST

No.	Item Description	Yes	No	Remarks
(n)	If interfaces are real, is GFE required?	___	___	
(o)	If GFE is required, has a request been made to obtain GFE?	___	___	
(p)	Is test DD 1423 documentation on schedule?	___	___	

DAT

ILM